# A Survey on Wireless Body Area Network's Applications

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## ABSTRACT

*Technologies are rapidly developed, enhanced and now its step is toward the medical science. Bans are the Wireless Body Area Network is network which provides continuous health monitoring of patients without any constraint of his daily life activities. In WBANs sensors are used to collect personal information of the patient. Once the data is received from sensors, it is displayed or stored in a database for future use. The aim of WBANs is to simplify and improve speed, accuracy, and reliability of communication of sensors within, on, and in the immediate proximity of a human body. The system has been successfully tested in real time where data was successfully obtained and displayed. Future enhancements to safeguard the data, including the encryption of the patient data is under investigation.*

**Keyword:** - *Wireless Body Area Network, Wireless Body Sensors (WBS)*

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## 1. INTRODUCTION

The objective of WBANs develops speed, accuracy and reliability of communication of sensors in direct proximity of human body[5].Wireless body area networks (WBANs) have seen massive level of growth in the recent past [13], [14]. Applications of the WBANs range from communication to navigation, surveillance to sport monitoring and remote health care to networking [1].

### 1.1. Wireless Body Area Networks

Wireless sensor network (WSN) technologies have the potential to change our lifestyle as healthcare, entertainment, travel, retail, industry, dependent care and emergency management, in addition to many other areas[2].Wireless body area network (WBAN) is a small scaled network that operates inside, on, or in the peripheral proximity of a body. WBAN is one of the main technologies which provide extremely high convenience and high efficiency in assisting healthcare or medical services. WBANs consist of a number of heterogeneous biological sensors. These sensors are positioned in different parts of the body and can be wearable or fixed under the user skin. These devices are used for measuring changes in a patient vital signs and detecting emotions or human statues. It is responsible for sending biological signals of the patient to the medical doctor in order to provide real time medical diagnostic and allow him to take the right decisions [3]. The sensors in the human body will gather various physiological changes in order to check the patient's health condition. This device will instantly transmit all information in real time to the doctors throughout the world. If an urgent situation is detected, the Doctors will directly inform the patient through the computer system by sending appropriate messages or alarms.

### 1.2. WBANs Architecture

The Wireless Body Area Network (WBAN) was implemented using a single hop star topology in beacon mode (data being sent continuously without interruption) where sensors collect data and send it to the base station which is the task manager of the network [4]**.**the WBAN common architecture consists of three tiers communications: Intra-BAN communications, Inter-BAN communications and beyond-BAN communications.

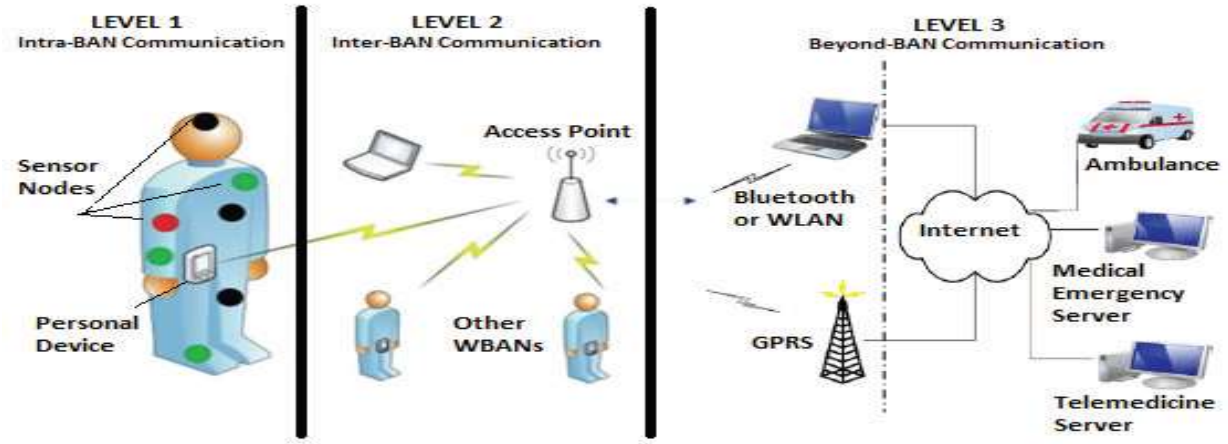


**Fig -1**: General architecture for Wireless Body Area Networks

Intra-BAN communications is a communications among wireless body sensors and the master node of the WBAN. Inter-BAN communications involve communications between the master node and personal devices such as notebooks, home service robots, and so on. The beyond-BAN tier connects the public device to the Internet [4]. In WBAN, Sensors are used to collect personal health information of patient.

**Fig -2:** Body Sensor

It is monitor vital signs of patient such as heartbeat, blood pressure, vision, electrocardiogram, diabetes, and oxygen level. These sensors are placed in different parts of body that can be wearable on patient body [3].

## 2. WBANs TECHNOLOGIES

### 2.1. Bluetooth

Bluetooth is a short-range wireless communication standard that defines the link and application layers to support data and voice applications. Bluetooth is available in mobile phones and laptops. Bluetooth SIG has developed the Bluetooth Health Device Profile (HDP) that defines the requirements for qualified Bluetooth healthcare and fitness device implementations. This profile is used for connecting application data source devices [6].

### 2.2. Bluetooth Low Energy

Bluetooth Low Energy (Bluetooth LE) is an latest standard that provides ultra-low-power idle mode operation, reliable point-to-multipoint data transfer with power save and encryption functionalities. It is designed to wirelessly connect small devices to mobile terminals. Bluetooth LE provide data rate up to 1Mbps [3].

### 2.3. ZigBee

ZigBee is a wireless Network technology which is widely used from the low power environment. It is targeted at radio-frequency applications that require a low data rate, long battery life and secure networking. and its 128-bit

security support to perform authentication and guarantee integrity and privacy of messages [3].ZigBee-based wireless devices operate in 868 MHz, 915 MHz, and 2.4 GHz frequency bands.

### 2.4. ANT

ANT is a proprietary technology designed for general-purpose wireless sensor network applications.ANT features are simple design, low latency, the ability to trade off data rate against power consumption, and a net data rate of 20 kb/s (over-the-air data rate is 1Mb/s).it provide low level security features.

### 2.5. SENSIUM

Sensium is a proprietary ultra-low-power transceiver platform custom designed for healthcare and lifestyle management applications. The network adopts a master-slave architecture, where a body-worn slave node periodically sends sensor readings central master node. Joining a network is centrally managed, and all communications are single- hop. Sensium features the leading ultra-low power solution (3mA @ 1.2V) for low-data-rate on-body applications [3].

## 3. WBNS APPLICATIONS

The WBNS Supports number of innovative Applications. BAN applications covers numerous fields in order to improve the user's quality of life. These applications are categories using whether they are used in medical field or non medical field.

### 3.1. *Medical applications comprise healthcare solutions for aging and diseased populations mainly.*

- **E-Health Care** - In BANS, E-health care available interface for diagnostics, for monitor of human physiological data, for management of drugs in hospitals and as an aid to treatment. In the future it will be possible to manage patients constantly and give the necessary medication whether they are at home or elsewhere and patient is not connected longer to the large technology for monitor.
- **LifeStyle and Sports -** In [7], a Wireless BAN is utilizing to resolve the direction of the golf club and the bough of the golfer to offer real-time response to the golfer in terms of hip movement and fondle details on the golf course. In accumulation, the body sensory data of a player's movement is composed to examine how to conserve energy and make the player perform at the maximum altitude over a long era of time.
- **Military Applications -** The Army Research Laboratory (ARL) has complete experiments using auditory sensor arrays hanging below tethered aerostats to sense and confine fleeting signals from mortars, weaponry and arms fire. This unrelenting inspection can have a important consequence on the survivability and lethality of our military. Inspiring the array gives a appreciably longer range of detections under flattering MET circumstances [8].Some of the military application for BANs includes monitoring health, location, and high temperature and hydration levels.
- **WBAN for Animals -** It may be used for improving health and diagnosis of different infectious diseases in human being as well as animals. If want to improve human health and control diseases we have to improve animals health and control diseases that give food to the human being e.g. milk, meet, eggs etc, it is important [9].
- **Networking and communications -** These help the integration with Internet and other networks, low operation and maintenance cost, highly secure wireless communication system to reduce the costs other resources required to manage a WSN [9].
- **Emotion Detection -** Recent research has shown the effective awareness of human emotions via speech and visual data analysis. Wearable sensing technologies have enabled emotion detection through the induction of physical manifestations throughout the body that leads to the production of signals to be measured via simple bio-sensors.

### 3.2. *Non-medical applications include motion and gestures detection for interactive gaming and fitness monitoring applications, cognitive and emotional recognition for driving assistance or social interactions and medicals assistance in disaster events, like terrorist attacks, earthquakes and bush fires.*

- **Emergency (non-medical) -** Off-body sensors (eg. built into the house) are capable of detecting a non-medical emergency such as fire in the home or poisonous gas in the house and must immediately communicate this information to body-worn devices to warn the wearer of the emergency condition [15].
- **Entertainment Applications -** This category consists of gaming applications and social networking Appliances such as microphones, MP3-players, cameras, head-mounted displays.

## 4. WBNS CHALLENGES

- **Security -** Security is more important to make WBAN transmission secure and accurate. privacy, authentication, reliability, and freshness of data together with accessibility and protected management are the security requirements in WBAN.
- **Reliability -** Data sent by WBAN sensors concern heath information for which high reliability is essential.
- **Interoperability -** WBAN systems would have to ensure seamless data transfer over standards such as Bluetooth, ZigBee etc. to advance information exchange, plug and play device interaction.
- **System devices -** The sensors used in WBAN would have to be low complexity, small in form factor, light in weight, power efficient, easy to use and reconfigurable. Further, the storage devices need to assist remote storage and performance of patient data and analysis tools via the Internet.
- **Data consistency -** Data residing on multiple mobile devices and wireless patient notes need to be collected and analyzed in a seamless fashion. Within body area networks, vital patient datasets may be split over a number of nodes and across a number of networked PCs or Laptops. If a medical practitioner′s mobile device does not contain all known information then the quality of patient care may degrade [10].
- **Cost -** Today's consumers expect low cost health monitoring solutions which provide high functionality. WBAN implementations will need to be cost optimized to be appealing alternatives to health aware consumers.

## 5. CONCLUSION

This paper shows the use and applications of Wireless Body Area Network. A discussion of wireless technologies for use in a WBAN application has also been given in this paper. In the near future, the evolution of WBANs for symbiotic and bio-inspired architectures can significantly improve the health conditions and lifetime expectation for a large number of people. WBANs will allow for continuous monitoring of patients and capable of early detection of abnormal conditions resulting in major improvements in the quality of life. It also introduced about the all technologies used in WBNs. It also satisfying many requirements of elderly people by enabling them to live safely, securely, healthily and independently. From this technology patient has wide range of benefits.

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